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CHAPTER – 2

IS MATTER AROUND US PURE

Mixture

Mixtures are constituted by more than one kind of pure form of matter, known as a substance. A substance cannot be separated into other kinds of matter by any physical process.

TYPES OF MIXTURES

Mixtures are of 2 types

(i) Homogeneous mixture

(ii) Heterogeneous mixture

Homogeneous mixture

A mixture which has a uniform composition throughout is called a homogeneous mixture or solution.

Examples: sugar in water, salt in water.

Heterogeneous mixture

A mixture which contains physically distinct parts and has a non-uniform composition is called a heterogeneous mixture.

Examples: Mixture of salt and iron filings, sand and sugar.

Solution

A solution is a homogeneous mixture of two or more substances. Example Lemonade, soda water etc

Component of solutions

(i) **solvent** :- The component of the solution that dissolves the other component in it (usually the component present in larger amount) is called the solvent.

(ii) **solute** :- The component of the solution that is dissolved in the solvent (usually present in lesser quantity) is called the solute.

Properties of a solution

- Its particles are too small and have a diameter less than 1 nm.
- The particles are not visible to naked eyes.
- Particles don't scatter a beam of light passing through it and hence do not show the Tyndall effect.
- The solute particles never settle down on keeping undisturbed.

The components of a solution cannot be separated using filtration

Alloys :- Alloys are homogeneous mixtures of metals and cannot be separated into their components by physical methods. But still, an alloy is considered as a mixture because it shows the properties of its constituents and can

have variable composition. For example, brass is a mixture of approximately 30% zinc and 70% copper.

CONCENTRATION OF A SOLUTION

Depending upon the amount of solute present in a solution, it can be called a dilute, concentrated or a saturated solution.

Saturated solution

At any particular temperature, a solution that has dissolved as much solute as it is capable of dissolving , is said to be a saturated solution. In other words, when no more solute can be dissolved in a solution at a given temperature, it is called a saturated solution.

solubility

The amount of the solute present in the saturated solution at this temperature is called its solubility.

unsaturated solution

If the amount of solute contained in a solution is less than the saturation level, it is called an unsaturated solution.

The concentration of a solution is the amount of solute present in a given amount (mass or volume) of solution, or

the amount of solute dissolved in a given mass or volume of solvent.

Concentration of solution = Amount of solute/ Amount of solution

Or Amount of solute/Amount of solvent

There are various ways of expressing the concentration of a solution, but here we will learn only two methods.

(i) Mass by mass percentage of a solution

$$= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

(ii) Mass by volume percentage of a solution

$$= \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$$

Suspension

A suspension is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of the medium.

Properties of a Suspension

Suspension is a heterogeneous mixture.

The particles of a suspension can be seen by the naked eye

The particles of a suspension scatter a beam of light passing through it and make its path visible.

The solute particles settle down when a suspension is left undisturbed, that is, a suspension is unstable. They can be separated from the mixture by the process of filtration

COLLOIDAL SOLUTION

A colloidal solution is a mixture in which the substances are regularly suspended in a fluid.

Tyndall Effect

Tyndall effect is the scattering of light by particles in a colloid or else particles in a very fine suspension.

- **e.g. It can be observed when sunlight passes through the canopy of a dense forest.**

Properties of a colloid

• A colloid is a heterogeneous mixture.

• The size of particles of a colloid is too small to be individually seen by naked eyes.

• Colloids are big enough to scatter a beam of light passing through it and make its path visible.

• They do not settle down when left undisturbed, that is, a colloid is quite stable.

.They cannot be separated from the mixture by the process of filtration. But, a special technique of separation known as centrifugation

The components of a colloidal solution are the dispersed phase and the dispersion medium.

Dispersed phase

The solute-like component of the dispersed particles in a colloid form the dispersed phase.

Dispersion medium

The component in which the dispersed phase is suspended is known as the dispersing medium.

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HOW CAN WE OBTAIN COLOURED COMPONENT (DYE) FROM BLUE/ BLACK INK?

Fill half a beaker with water.

- **Put a watch glass on the mouth of the beaker**
- **Put few drops of ink on the watch glass.**
- **Now start heating the beaker. We do not want to heat the ink directly. You will see that evaporation is taking place from the watch glass.**

• Continue heating as the evaporation goes on and stop heating when you do not see any further change on the watch glass

We find that ink is a mixture of a dye in water. Thus, we can separate the volatile component (solvent) from its non-volatile solute by the method of evaporation

HOW CAN WE SEPARATE CREAM FROM MILK?

• Take some full-cream milk in a test tube.

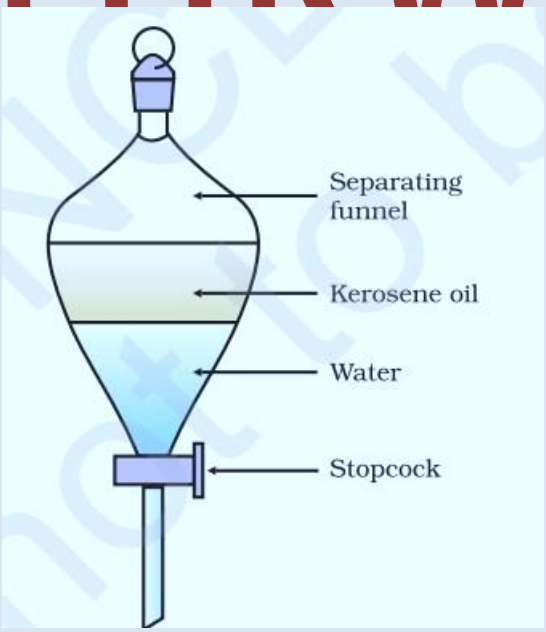
• Centrifuge it by using a centrifuging machine for two minutes. If a centrifuging machine is not available in the school, you can do this activity at home by using a milk churner, used in the kitchen.

• If you have a milk dairy nearby, visit it and ask (i) how they separate cream from milk and (ii) how they make cheese (paneer) from milk.

HOW CAN WE SEPARATE A MIXTURE OF TWO IMMISCIBLE LIQUIDS?

Let us try to separate kerosene oil from water using a separating funnel.

- **Pour the mixture of kerosene oil and water in a separating funnel**
- **Let it stand undisturbed for sometime so that separate layers of oil and water are formed.**
- **Open the stopcock of the separating funnel and pour out the lower layer of water carefully.**
- **Close the stopcock of the separating funnel as the oil reaches the stop-cock.**

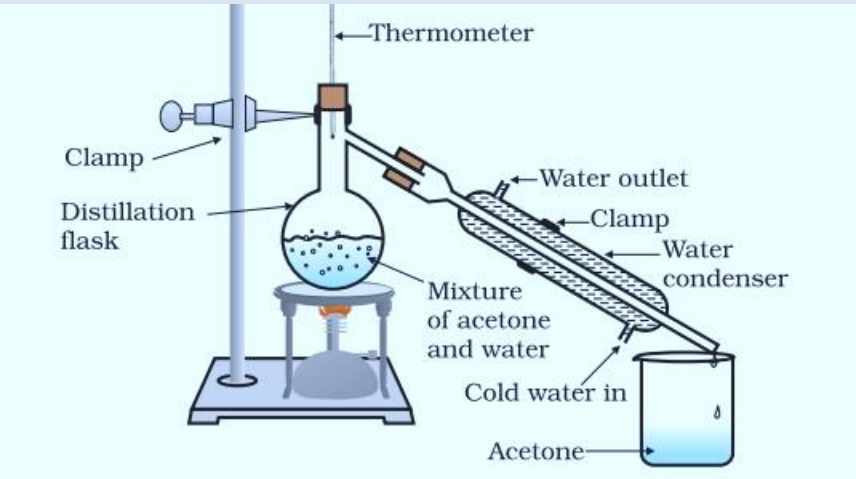


chromatography

Chromatography is the technique used for separation of those solutes that dissolve in the same solvent.

HOW CAN WE SEPARATE A MIXTURE OF TWO MISCIBLE LIQUIDS?

- **Take the mixture in a distillation flask. Fit it with a thermometer.**
- **Arrange the apparatus.**
- **Heat the mixture slowly keeping a close watch at the thermometer.**
- **The acetone vaporises, condenses in the condenser and can be collected from the condenser outlet.**
- **Water is left behind in the distillation flask.**



Distillation

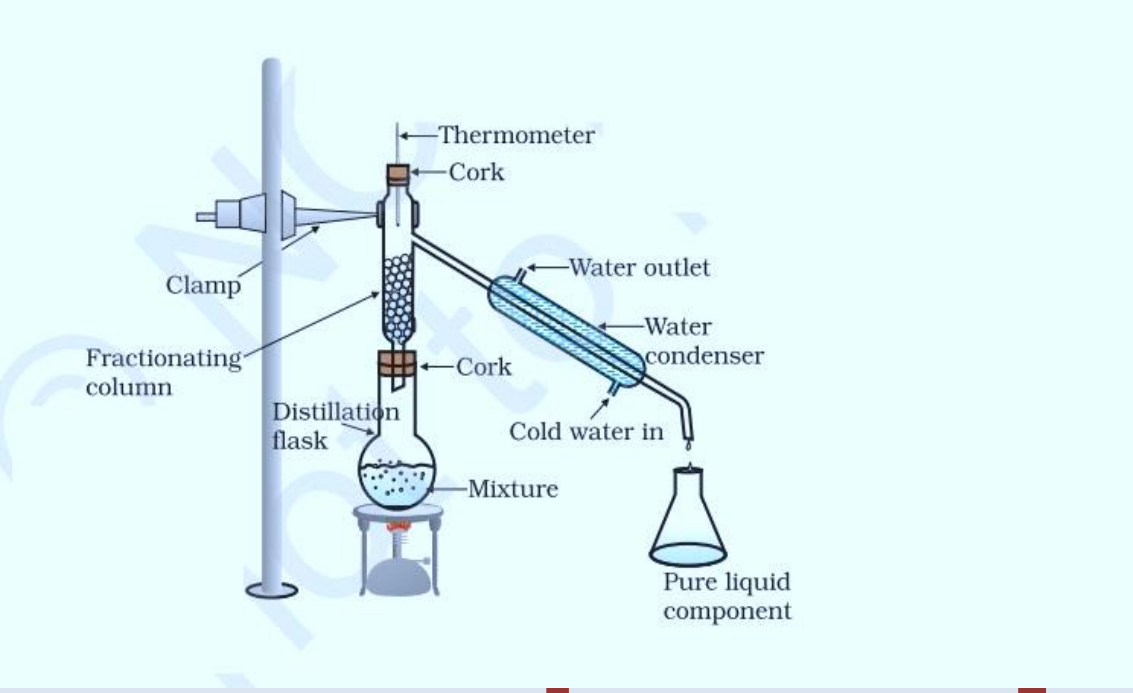
This method is called distillation. It is used for the separation of components of a mixture containing two miscible liquids that boil without decomposition and have sufficient difference in their boiling points.

fractional distillation

To separate a mixture of two or more miscible liquids for which the difference in boiling points is less than 25 K, fractional distillation process is used, for example, for the separation of different gases from air

HOW CAN WE OBTAIN DIFFERENT GASES FROM AIR ?

Air is a homogeneous mixture and can be separated into its components by fractional distillation.



If we want oxygen gas from air, we have to separate out all the other gases present in the air. The air is compressed by increasing the pressure and is then cooled by decreasing the temperature to get liquid air. This liquid air is allowed to warm-up slowly in a fractional distillation column, where gases get separated at different heights depending upon their boiling points.

Crystallisation

Crystallisation is a process that separates a pure solid in the form of its crystals from a solution. Crystallisation technique is better than simple evaporation technique as – • some solids decompose or some, like sugar, may get charred on heating to dryness. • some impurities may remain dissolved in the solution even after filtration. On evaporation these contaminate the solid

Elements

- Elements are species of atoms which have the same number of protons in their atomic nuclei.
- Elements are represented by symbols e.g.Hydrogen (H), Boron (B), Carbon (C), Silicon (Si) etc.

Metals

- Metal is a solid material which is typically hard, shiny, malleable, fusible, and ductile, with good electrical and thermal conductivity.
- Examples: Aluminium, Copper, Iron, Tin, Gold

Metalloids

- Metalloids exhibit some properties of metals as well as of non-metals.
- Examples: Boron, silicon, germanium, arsenic, antimony, and tellurium

COMPOUNDS

A compound is a substance composed of two or more elements, chemically combined with one another in a fixed proportion

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